

REMARKS

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the amendments above and the remarks below.

Rejection of claim 1

Claim 1 stands finally rejected under 35 USC § 103 as being obvious from JP 02-177496 in view of Schafer U.S. Patent No. 5,863,620 alone or further in view of JP 02-108558 and JP 2002-166225 and Sullivan U.S. Patent No. 4,996,827. Though not cited in the opening identification of the rejection of claim 1 on p. 6 of the Office Action, the Examiner also references in the rejection IBM Technical Disclosure Bulletin, April 1974, Vol. 16, No. 11, p.3564 "Roll Extrusion Filling of Small Vias." Office Action, p. 7.

Claim 1 is directed to the embodiment of the invention wherein the surface to which the paste is applied is on the roller. The JP 02-177496 reference shows the roller rolling the solder paste already on the surface of the printed circuit board. The Schafer patent discloses the application of liquid coating composition at an elevated temperature by forming troughs of the composition between metering rolls 2, 4 and applicator rolls 1, 3, respectively. The liquid coating is therefore applied uniformly to the entire surface of the applicator rolls. Claim 1 recites that the paste is applied selectively, to only portions of the roller surface, and the combination of the JP 02-177496 and Schafer references do not disclose or suggest applicants' method as recited in claim 1.

Likewise, the additional JP 02-108558, JP 2002-166225 and Sullivan '827 patent references do not render obvious the claimed method of selectively applying a discontinuous bead of flowable paste directly to a side of the roller surface facing the mask. Although the Examiner takes the position that these additional references "teach applying a 'pattern' coating on a roller and then transferring that to a substrate" (Office Action, p. 7), there is no disclosure of selectively applying a discontinuous bead of flowable paste as applicants claim.

The Examiner has also taken the position that application of paste, whether continuous or discontinuous, would be a matter of "design choice of one practicing in the art absent a showing of criticality regarding this limitation." Office Action, pp. 7 and 8. Contrary to the Examiner's position, applicants submit that their claimed application of a discontinuous bead of paste in the method of claim 1 would not be merely a matter of design choice, particularly where the paste is "applied only to portions of the roller surface" and then flowed "into openings in the mask" as recited in claim 1. This may be used to apply paste efficiently to correspond to the mask openings. Specification, para. 0008 and 0036. The newly cited Sullivan '827 patent in particular lacks any disclosure of applying a discontinuous bead (or any bead for that matter) onto a side of a roller surface. The IBM Technical Disclosure Bulletin discloses the application of the paste on the mask over the green ceramic sheet prior to the placement of the top Mylar sheet, and also lacks any disclosure of applying a paste bead) onto a side of a roller surface.

Accordingly, applicants' claim 1 is not obvious to one of ordinary skill in this art from the cited references.

Rejection of claims 2, 4-9, 11-19 and 24

Claims 2, 4-9, 11-18 and 24 stand finally rejected under 35 USC § 103 as being obvious from JP 02-177496 in view of IBM Technical Disclosure Bulletin, April 1974, Vol. 16, No. 11, p.3564 "Roll Extrusion Filling of Small Vias" and further in view of Sullivan U.S. Patent No. 4,647,524 alone or in combination with Sullivan U.S. Patent No. 4,996,827. Claim 19 stands rejected under 35 USC § 103 as being obvious from JP 02-177496 in view of the IBM Technical Disclosure Bulletin and Sullivan U.S. Patent No. 4,647,524, and further in view of Casey et al. U.S. Patent Publication No. 2002/009539 alone or in combination with Sullivan U.S. Patent No. 4,996,827. Applicants respectfully traverse these rejections.

Claims 2, 4-9, 11-19 and 24 are directed to the embodiment of the invention wherein the film or film strip is separate from the roller. Claims 2, 15 and 24 recite applying a flowable paste to a portion of side of the surface, film or film strip facing a mask over a circuit board, prior to the paste contacting the mask, and then using a roller to flow the paste on the surface, film or film strip into openings in the mask. Claims 2 and 15 further recite that the paste is applied in a bead to the film strip or film.

The JP 02-177496 reference shows the roller rolling the solder paste already on the surface of the printed circuit board, and the IBM Technical Disclosure Bulletin discloses the application of the paste on the mask over the green ceramic sheet prior to the placement of the top Mylar sheet. As the Examiner has acknowledged, the combination "fails to teach applying paste to the 'portion of side facing the mask', i.e., the underside of the film strip." Office Action, p. 3.

The Sullivan '524 patent is cited for the aforementioned missing disclosure. However, the Sullivan '524 patent does not teach applying a flowable paste to a film, and further does not teach rolling a surface containing paste over the mask. Instead, the Sullivan '524 patent adheres a dry film photopolymer layer 14 to a polyester fabric screen 18, and then uses a squeegee to force the dry film photopolymer layer 14 onto a liquid polymer layer 19 on the board.

The Sullivan '827 patent in combination with the aforementioned references also does not render obvious the invention of claims 2, 15 and 24. Sullivan '827 at the cited column 7, lines 35 to column 8, line 35 teaches that a composite solder mask may be used, where an outer layer of paste consistency liquid photopolymer is applied to a surface of an image-bearing photomask, and then exposure to a UV light source through the photomask partially hardens the light-struck photopolymer to form a desired pattern. The photomask is then mated with a printed wiring board (PWB) surface that has been coated overall with a thin layer of paste consistency solder mask photopolymer, further exposed to UV light, the unhardened photopolymer removed by solvent spray, and the remaining cured photopolymer form the fully cured pattern.

Thus, Sullivan '524 and 827 fail to suggest applying a flowable paste to a film, and flowing the paste into openings in a mask. Moreover, there is no suggestion that these methods may be used with a roller application, as applicants claim.

While the Examiner acknowledges that dry film photopolymer layer 14 "is different and is not supplied to a mask" and that the "supply" of the coating material is what is relied upon (Office Action, p. 4), nevertheless the adhering of a dry film or partially cured layer first to a screen and then to a liquid layer is fundamentally different from applicants' claimed application of flowable paste to a film and then to openings in

a mask. The Examiner has also taken the position that "the application 'type' would be dependent on the desired end product and would be within the skill of the one practicing in the art." Office Action, p. 4. However, the Examiner has not cited any art for such proposition, and claims 2, 15 and 24 are therefore not obvious to one of ordinary skill in this art.

Additionally, the cited references in combination do not disclose or suggest applying a bead of the flowable paste to the film strip or film, as recited in claims 2 and 15. The claimed application of a bead of flowable paste to a side of the surface facing the mask is relevant to the subsequent step of flowing the paste into openings in the mask so as to make the process more effective and efficient. Specification, para. 0008 and 0036. The hypothetical combination of Sullivan '524 and/or '827 with the JP and IBM references to reject these claims is therefore a selective one, based not on any teachings in any of the references, but instead based on a hindsight reconstruction made with the benefit of applicants' own specification. As such the invention as recited in claims 2 and 15 is not obvious from the cited prior art.

Likewise, it would not be obvious from the cited art to apply the paste in a bead across the surface, parallel to the roller axis (claim 4), in a continuous bead across the surface, parallel to the roller axis (claims 5 and 16), in a discontinuous bead across the surface, parallel to the roller axis (claims 6 and 17), or in a bead across the surface, parallel to the roller axis, at a variable rate of speed (claims 7 and 18). The cited combination of the JP, IBM and Sullivan '524 and '827 references also does not disclose or suggest the subject matter of claim 14 (dependent on claim 2), namely, that velocity of the roller is varied to compensate for variations in bow wave volume or

shear thinning of the paste. The advantages of such particular paste applications are described in the Specification at para. 0008 and 0036.

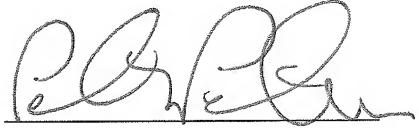
Claim 19, dependent on claim 15, describes that the film is in the form of a strip, and a spool is provided for the strip. While the Examiner cites the Casey patent as rendering obvious claim 19, the blotter strip 22 is provided for the purpose of absorbing any excess solvent from the top of mask 14 and the paste, and does not have any part in the application of a bead of the paste to openings in the mask. Casey therefore does not make up for the deficiencies of the JP 02-177496, IBM Technical Disclosure Bulletin, and Sullivan '524 and '827 references.

Since the cited references separately or in combination do not disclose or suggest applicants' aforementioned methods, applicants' claims 2, 4-9, 11-19 and 24 are not obvious to one of ordinary skill in the art.

Applicants have previously amended and have cancelled claims in this application. Applicants are not conceding in this application that the claims as they stood prior to amendment are not patentable over the art cited by the Examiner, as the present claim amendments and cancellations are only for facilitating expeditious prosecution and allowance of the claims. Applicants respectfully reserve the right to pursue these prior and other claims in one or more continuation and/or divisional patent applications.

It is respectfully submitted that the application has now been brought into a condition where allowance of the entire case is proper. Reconsideration and issuance of a notice of allowance are respectfully solicited.

Respectfully submitted,



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